

REMARKS

Claims 1 and 3-10 were pending in the application, of which claims 1 and 3-7 were last examined. Claims 8-10 are deemed withdrawn. By this amendment, claim 1 has been canceled without prejudice and new claim 12 has been added. Claims 3, 6, 8, 9, and 11 have been amended to change their dependency.

Applicants believe the amendments made herein add no new matter. Any amendments to the claims which have been made in this amendment, and which have not been specifically noted to overcome a rejection based on prior art, should be considered to have been made for a purpose unrelated to patentability, and no estoppel should be deemed to be attached thereto. Reconsideration and reexamination of the application is respectfully requested in view of the amendments and the following remarks.

Status of Claims

Claims 8-10 are deemed withdrawn. Applicants have filed a contemporaneous petition to revert the restriction of claims 8-10.

Rejections under 35 U.S.C. §103

Claims 1 and 3-7 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Gamson et al. '017 in view of Snodgrass et al.. '740 The rejection is respectfully traversed.

Claim 1 has been canceled, but the rejection will be discussed with regard to new claim 12, from which the remaining claims now depend.

Gamson et al. '017 discloses a method of treating a spent potliner for the expressed purpose of efficiently recovering fluorides for reuse in aluminum reduction cells. (Col 2, ll. 1-8) Gamson et al. '017 discloses the following steps for treating a spent potliner in order to recover the fluorides:

- (1) crushing and classifying the spent potliner to particle sizes of not less than 1mm (col. 3, ll. 38-50);
- (2) fluidizing the particles with air (Colo. 52-54);
- (3) adding SO₂ to facilitate the reaction (Col. 4, ll. 5-32);
- (4) heating the mixture in a furnace in a preferred temperature range of about 850° C to about 880° C to maximize Al₂O₃ formation, minimize ash formation, minimize liquid Na₂SO₄ formation, and maximize HF enriched gas formation (Col. 4, line 33 through Col. 5, line 23);

- (5) reacting the HF enriched gas with feed material in a second reactor to produce fluorine - containing chemicals (e.g., aluminum trifluoride) (Col. 5, ll. 24-60); and
- (6) cooling the HF gas, with a water spray for example (Col. 5, line 61 through Col. 6, line 6).

Gamson et al. '017 is silent about disposal of other residues from the process; it is concerned only with the production of HF gases for reuse.

Snodgrass et al. '740 discloses a method of treating a spent potliner for the expressed purpose of recovering fluoride values for recycling to aluminum reduction cells. (Col. 2, ll. 18-28) and for making the remaining residue safe for landfill disposal (Col. 2, ll. 33-34). Snodgrass et al. '740 discloses the following steps for treating a spent potliner:

- (1) crushing and grinding the spent potliner to a particle size less than 1mm (Col. 3, ll. 8-11);
- (2) incinerating the materials at 650°C to 950°C to combust most of the carbon (80-95%), destroy cyanides, and limit volatilization of fluorides (less than 3-6%) (Col. 3, ll. 12-25);
- (3) leaching the ash residue with water or dilute caustic at between about 1-5 atmospheres pressure, and between about 75° C and 100° C temperature for 10 minutes to 3 hours (Col. 3, ll. 28-40);
- (4) separating the solids from the leachate by filtration (Col. 3, ll. 41-43);
- (5) treating the solid residue with sulfuric acid to neutralize or minimize fluorides for disposal in a landfill (Col. 3, ll. 44-52);
- (6) precipitating calcium fluoride from the leachate with a calcium compound (Col. 3, ll. 53-61); and
- (7) mixing calcium fluoride with sulfuric acid to generate HF gas for reuse in a smelting process, and to generate metal sulfate for landfill disposal (Col. 3, ll. 62-68).

Combining the disclosures of Gamson et al. '017 and Snodgrass et al. '740 would not be obvious to one of ordinary skill. They are really two completely different ways to achieve a similar result, to-wit: the recovery of fluorides for reuse in aluminum reduction cells. Gamson et al. '017 incinerates the spent potliner material a temperature high enough to recover all of the HF gases from the residue. Snodgrass et al. '740 incinerates the spent potliner material at a temperature low enough to keep the fluorides in the residue. Snodgrass et al. '740 leaches the residue to recover the fluorides from the leachate. If one were to leach the residue in Gamson et al. '017 as taught by Snodgrass et al. '740, it would be unproductive because the fluorides had all been volatilized in the furnace. Conversely, if one were to attempt to recover HF gases from the furnace of Snodgrass et al. '740 as taught by Gamson et al. '017, it would be unproductive because the furnace was not hot enough to volatilize the fluorides - one would recover no more

than about 3-6% at most. Combining Gamson et al. '017 and Snodgrass et al. '740 as suggested by the Examiner is completely inapposite.

More importantly, neither Gamson et al. '017 nor Snodgrass et al. '740, alone or combined, reach the claimed invention.

The invention claims a method of treating a spent potliner for the purpose of recovering non-toxic mineral products that includes non-gaseous fluorides. The process comprises the following steps:

- (1) crushing and classifying the spent potliner,
- (2) placing the classified and crushed spent potliner in a furnace,
- (3) adding no more than air to the furnace,
- (4) heating the spent potliner in the furnace to a temperature greater than 450°C to oxidize the spent potliner and less than a temperature at which fluorides enter the gaseous phase to minimize fluoride volatilization,
- (5) mixing the hot product from the furnace with water at a substantially lower temperature to produce reaction gases and residue,
- (6) destroying flammable gases in the reaction gases by burning, and
- (7) mixing the residue with water in a well ventilated area for a period of weeks to cure and further detoxify the residue

There are several fundamental differences between the claimed invention and the cited references, either alone or in combination. The first is that in the subject application spent potliners are treated to remove the harmful substances and then blended with other chemicals and minerals to provide a useful mineral product containing all of the valuable compounds in the potliners, including fluorides and carbon that have useful roles to play in the ultimate end use of the product from the inventive method. The method as claimed does not remove fluorides during the treatment process. In contrast, both cited references disclose methods for treating spent potliners where the primary purpose is the recovery of fluorine values and the neutralization of the residue so that it can be used as landfill. The whole purpose of the invention of the subject application is that there is no residue that has to be used as landfill. The Examiner asserts that the residues from the Gamson et. al process and the claimed method are identical or substantially identical in structure and composition. The Examiner further asserts that it would have been obvious to mix the residue of Gamson et al. with water as disclosed by Snodgrass et al. in order to leach the ash residue and remove any residual fluoride from the ash residue. (Office Action para. 3) The alleged combination misses the point entirely. Gamson reacts the crushed potliner at a temperature high enough to volatilize all of the fluorides in the material because the Gamson

et al. process seeks to recover fluorides in the gaseous HF from the furnace. Snodgrass does not volatilize the fluorides in the furnace, but rather extracts the HF gases from calcium fluorides precipitated from the leachate in a secondary operation. Snodgrass neutralizes or minimizes fluorides in the solid residue from the furnace by sulfuric acid. The invention, on the other hand, does nothing to destroy, minimize, or neutralize fluorides. It doesn't involve a leaching step at all. Rather, it uses relatively cold water to create a thermal shock and fracture the residue to enhance the process of creating reaction gases including, *inter alia*, acetylene, ammonia, hydrogen and methane. It does not generate HF gases; the fluorides are retained in the residue.

Second, the Examiner asserts that Gamson et al. '017 discloses all of the limitations of the invention except for the burning step. The claimed invention requires adding no more than air to the furnace. Gamson et al. '017 requires adding SO₂ to facilitate the reaction (Col. 4, ll. 5-32). The methods are clearly different. Also, the claimed invention requires heating the spent potliner in the furnace to a temperature greater than 450°C to oxidize the spent potliner and less than a temperature at which fluorides enter the gaseous phase to minimize fluoride volatilization. Gamson et al. '017 requires heating the material hot enough to volatilize the fluorides in HF enriched gases.

Third, the claimed method requires mixing the hot product from the furnace with water at a substantially lower temperature to produce reaction gases and residue, a step not found in either Gamson et al. '017 or Snodgrass et al. '740. Gamson et al. '017 is silent about what happens to the residue, focusing entirely on recovering fluorides from the HF enriched gases exiting the furnace. Snodgrass et al. '740 teaches leaching the residue with water or caustic in order to later recover fluorides from the leachate, preferably at elevated pressure and elevated temperature. To leach, by definition, means to cause a liquid to percolate through a material by which soluble constituents can be removed from the material. (Oxford English Dictionary, 2d ed.) It is important in Snodgrass et al. '740 to recover the leachate from which the fluorides are later extracted. The claimed method does not have a leaching step. Rather, the mixing step is done at a significant temperature difference to cause the residue to fracture and to cause the generation of steam and flammable gases. The hydro reaction step 40 of the invention is significantly different than the leaching step of Snodgrass et al. '740.

Fourth, the process of the claimed invention is also specifically concerned with neutralization of the reactive compounds that are a potential source of flammable gases. More

specifically, the invention as claimed includes a destroying step where reaction gases are burned off. Neither of the cited references discloses or suggests such a step. The Examiner asserts that a prima facie case of obviousness is established because the residues resulting from the inventive process and from the Gamson et al. process are identical or substantially identical so that burning reaction gases in the Gamson et al. process would be expected. As mentioned above, the substances are clearly and critically *not* identical; the residue from the Gamson et al. process lacks fluorides that have been volatilized; the residue from the claimed process retains the fluorides. Moreover, the Gamson et al. process has no reason to burn reaction gases because the initial incineration is done at a high enough temperature to volatilize virtually all gases from the spent potliner. To burn the reaction gases from the furnace in Gamson et al. would also result in the destruction of the HF gases for which recovery is sought. Instead, Gamson et al. clearly teaches a second reaction with various feed materials to produce fluorine containing chemicals from the HF enriched reaction gases (see Gamson et al., Col. 5, ll. 24-60).

Fifth, the claimed invention cures the residue by a curing step carried out through a mixing of the residue with water in a well ventilated area for a period of weeks. Gamson et al. '017 is silent about disposal of residues from the process. Snodgrass et al. '740 does not teach or suggest a curing step after the mixing step. Rather, Snodgrass et al. '740 teaches treating the solid residue with sulfuric acid to neutralize or minimize fluorides for disposal in a landfill (Col. 3, ll. 44-52). The Examiner apparently (and wrongly) equates the leaching step of Snodgrass et al. '740 with the curing step of the claimed method, asserting that the temperature range of 20° C to 120° C and the time range of 10 minutes to 3 hours taught in Snodgrass et al. '740 overlap the temperature range of the water in the mixing step of the claimed invention and the time range of weeks in the curing step of the invention. The Examiner agrees that Snodgrass et al. '740 does not disclose exposing the mixture in a pile in a ventilated location but asserts that it would have been obvious to do so to improve efficiency. In reaching his conclusion, however, the Examiner conflates the mixing and curing steps of the claimed invention to find both of them obvious in view of the leaching step of Snodgrass et al. '740. The mixing step of the claimed invention is done at a large temperature differential to generate steam and reaction gases. It is followed by a separate destruction step to burn off the flammable reaction gases and a separate curing step that takes weeks to accomplish. In Snodgrass et al. '740, the leaching step occurs in a period of 10 minutes to 3 hours, followed by a filtration step, and thereafter, separate treatments for the solid

residue and for the leachate. Snodgrass et al. '740 says only that the solid residue is mixed with sulfuric acid, separated, and sent to landfill (Col. 3, ll. 44-52). Optimizing the time and temperature of the solid residue as suggested by the Examiner is of no consequence in Snodgrass et al. '740. There is no reason to "cure" the solid residue; it is enough in Snodgrass et al. '740 to treat the solid residue with sulfuric acid to remove any residual fluorides. The given process will not be any more efficient by allowing it to occur for weeks, or allowing it to occur in a pile in a ventilated area.

The combination of the Gamson et al. '017 patent and the Snodgrass et al. '740 patent, regardless of how they are combined, will not lead one of ordinary skill to a process of treating a spent potliner that does not remove the fluorides. Nor will the cited references lead one of ordinary skill to a process that includes a destruction step where reaction gases of the mixing step are burned off. Nor will the cited references lead one of ordinary skill to a curing step where the residue is treated with water in a ventilated area for weeks as called for in claim 12.

The alleged combination would actually teach away from a process that does not remove fluorides because both the Gamson et al. '017 patent and the Snodgrass et al. '740 patent teach extracting the fluorides. Further, a burning step in either the teaching of the Gamson et al. '017 patent or the Snodgrass et al. '740 patent would volatilize the very HF gases that their references seek to extract.

Given the foregoing, the alleged combination does not reach the invention of claim 12. Because the alleged combination does not reach the claimed invention, claim 12 cannot be said to be obvious in view of the alleged combination, and therefore claim 12 is patentable over the alleged combination. And inasmuch as claims 3-7 depend from claim 12, they are likewise patentable for the same reasons as claim 12.

Moreover, since claims 8-10 and claim 11 are also dependant upon claim 12, they are patentable over the alleged combination for the same reasons.

CONCLUSION

Applicants submit that all of the claims remaining in the application are allowable over the prior art of record. Prompt notification of allowability is respectfully requested. If there are any outstanding issues that the Examiner feels may be resolved by way of telephone conference, the Examiner is cordially invited to contact the undersigned to resolve these issues.

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Respectfully submitted,

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